Notice of Allowability	Application No. 10/767,420	Applicant(s) ANIKITCHEV ET AL.	
	Examiner Hung T. Vy	Art Unit 2821	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to _____.

2. ☒ The allowed claim(s) is/are *1, and 3-30*.

3. ☒ The drawings filed on *29 January 2004* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 01/29/2004 #4
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *04/28/2005* .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Don Wong
Supervisory Patent Examiner
Technology Center 2800

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1, 3-30, drawn to a multilayer semiconductor laser, classified in class 372, subclass 75.

   II. Claims 31-32, drawn to a method of making a semiconductor laser comprising, classified in class 257, subclass 94.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, unpatentabilities of the group I invention would not necessarily imply unpatability of the group II invention, since the device of the group I invention could be made by other and materially different processes from those of the group II invention, for example, in the claim 1, the generated the first wavelength and second wavelength can make in different method.

2. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, the fields of search are not co-extensive. Therefore, separate examination would be required and restriction for examination purposes as indicated is proper.

3. During a telephone conversation with Attorney Michael A. Stallman on 04/28/2005, a provisional election was made **without** traverse to prosecute the invention of Group I, **claims 1-30**. Affirmation of this election of claims must be made by applicant in replying to this Office action.

Claims 1-7 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Examiner's Amendment

4. An examiner's amendment to the record appears below. Should the changes and /or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.3.12. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

5. The following claim has been amended upon agreement by applicant during a telephone conversation with Mr. Michael A. Stallman on 04/28/2005.

Cancel claims 31-32.

The following are claim's amendment:

Listing of Claims:

1. (Currently amended) A multilayer semiconductor laser, comprising:
a substrate;
a multilayer semiconductor heterostructure formed on the substrate;
said heterostructure being divided into a plurality of electrically pumped regions and an elongated optically pumped region;
said optically pumped region being optically pumped by radiation having a first wavelength generated and deposited laterally into the optically pumped region by said electrically pumped regions; [[and]]

wherein said optically pumped region is configured to generate radiation having a second wavelength longer than said first wavelength in response to said optical pumping and said second wavelength radiation is delivered as output radiation from one end of said optically pumped region; and
wherein each of said electrically pumped regions has, at an end thereof furthest from said optically pumped region, a multilayer mirror having a high reflectivity at said first wavelength and a low reflectivity at said second wavelength.

2. (cancelled)

3. (original) The laser of claim 2, wherein said reflectivity at said first wavelength is greater than 99% and said reflectivity at said second wavelength is less than 5%.

4. (original) The laser of claim 1, wherein said plurality of electrically pumped regions includes a first plurality thereof arranged along one side of said optically pumped region and a second plurality thereof arranged along an opposite side of said optically pumped region.

5. (original) The laser of claim 4, wherein each of said electrically pumped regions is laterally separated from an adjacent one thereof by a first groove formed in said heterostructure.

6. (original) The laser of claim 5, wherein each of said electrically pumped regions is longitudinally separated from said optically pumped region by a second groove formed in said heterostructure.

7. (original) The laser of claim 1, wherein said heterostructure includes a quantum-well layer sandwiched between upper and lower waveguide layers, said quantum-well layer and waveguide layers being sandwiched between upper and lower cladding layers.

8. (original) The laser of claim 7, wherein each of said electrically pumped layers includes an electrode layer surmounting said upper cladding layer.

9. (original) A multilayer semiconductor laser, comprising:
a substrate;
a multilayer semiconductor heterostructure formed on the substrate;
said heterostructure being divided into a plurality of electrically pumped regions and an elongated optically pumped region;
said optically pumped region being optically pumped by radiation having a first wavelength generated and deposited laterally into the optical pumped region by said electrically pumped regions;
wherein said optically pumped region is configured to generate radiation having a second wavelength longer than said first wavelength in response to said optical

pumping and said second wavelength radiation is delivered as output radiation from one end of said optically pumped region; and
wherein each of said electrically pumped regions has, at an end thereof furthest from said optically pumped region, a first multilayer mirror having a high reflectivity at said first wavelength and a low reflectivity at said second wavelength.

10. (original) The laser of claim 9, wherein said plurality of electrically pumped regions includes a first plurality thereof arranged along one side of said optically pumped region and a second plurality thereof arranged along an opposite side of said optically pumped region.

11. (original) The laser of claim 10, wherein said electrically pumped regions are laterally separated from each other by a plurality of first grooves, with one of said first grooves between adjacent ones of said electrically pumped regions.

12. (original) The laser of claim 11, wherein said electrically pumped regions are longitudinally separated from said optically pumped region by two second grooves formed in said heterostructure, with one of said second grooves formed along one edge of said optically pumped region and the of said second grooves formed along an opposite edge of said optically pumped region.

13. (original) The laser of claim 12, wherein each of said electrically pumped regions has a laser resonator formed between said mirror on one end thereof and one of said second grooves.

14. (original) The laser of claim 11, wherein an end of each of said electrically pumped regions opposite said mirrored end thereof are continuous with said optically pumped region, wherein each of said electrically pumped regions has the same width, wherein there are same number of said electrically pumped regions on each side of said optically pumped region and said electrically pumped regions on opposite sides of said regions are aligned with each other, and wherein for each pair of aligned electrically pumped regions a laser resonator is formed between said mirror on the end of one of said electrically pumped regions and said mirror on the end of the other of said electrically pumped regions.

15. (currently amended) A multilayer semiconductor laser, comprising:
a substrate;
a multilayer semiconductor heterostructure formed on the substrate;
said heterostructure being divided into an elongated first region having arranged along each side thereof a plurality of electrically pumped second regions; and
said electrically pumped regions having equal width and having equal lateral spacing, with each of said electrically pumped regions on one side of said first region being aligned with a corresponding one of said electrically pumped

regions on the opposite side of said first region, each of said electrically pumped regions having, at an end thereof furthest from said first region, a multilayer mirror having a high reflectivity at [[said]] a first wavelength and a low reflectivity at a second wavelength longer than said first wavelength, said aligned ones of said electrically pumped regions generating laser radiation having [[a]] said first wavelength, said first wavelength radiation circulating laterally through said first region between said first mirrors on the ends of said aligned ones of said electrically pumped regions with a portion of said circulating first wavelength radiation being absorbed in said first region in passing therethrough; and
said first region being optically pumped by said absorbed first-wavelength radiation and said first region having at one end thereof a second multilayer mirror having a high reflectivity at said second wavelength and at an opposite end thereof a third mirror having a lower reflectivity at said second wavelength than said first mirror, whereby said optically pumped first region generates radiation having said second wavelength in response to said optical pumping, and said second wavelength radiation circulates in said optically pumped region between said second and third mirrors and is delivered as output radiation via said third mirror.

16. (original) The laser of claim 15, wherein said heterostructure includes a quantum-well layer sandwiched between upper and lower waveguide layers, said quantum-well layer and waveguide layers being sandwiched between upper and lower cladding layers.

17. (original) The laser of claim 16, wherein each of said electrically pumped regions includes an electrode layer surmounting said upper cladding layer.

18. (original) The laser of claim 17, wherein adjacent ones of said electrically pumped second regions are laterally separated by a groove etched in said heterostructure.

19. (original) The laser of claim 18, wherein said groove has a width of about 10.0 micrometers.

20. (original) The laser of claim 18, wherein said groove extends in depth at least to said quantum-well layer.

21. (original) The laser of claim 18, wherein said groove extends in depth through said lower waveguide layer.

22. (currently amended) A multilayer semiconductor laser, comprising:
a substrate;
a multilayer semiconductor heterostructure formed on the substrate;

said heterostructure being divided into an elongated first region having arranged along each side thereof a plurality of electrically pumped second regions; adjacent ones of said electrically pumped regions being laterally spaced apart and from each other by a first groove, and each of said electrically pumped regions longitudinally spaced from said first region by one of two first grooves formed in said heterostructure, one thereof along each side of said first region, each of said electrically pumped regions having, at an end thereof furthest from said first region, a multilayer mirror having a high reflectivity at [[said]] a first wavelength and a low reflectivity at a second wavelength longer than said first wavelength, each of said electrically pumped regions generating laser radiation having [[a]] said first wavelength and delivering said first wavelength radiation across said groove laterally into said first region; and
said first region being optically pumped by said first-wavelength radiation delivered thereto, and said first region having at one end thereof a second multilayer mirror having a high reflectivity at said second wavelength and at an opposite end thereof a third mirror having a lower reflectivity at said second wavelength than said first mirror, whereby said optically pumped first region generates radiation having said second wavelength in response to said optical pumping, and said second wavelength radiation circulates in said optically pumped region between said second and third mirrors and is delivered as output radiation via said third mirror.

23. (original) The laser of claim 22, wherein said heterostructure includes a quantum-well layer sandwiched between upper and lower waveguide layers, said quantum-well layer and waveguide layers being sandwiched between upper and lower cladding layers.

24. (original) The laser of claim 23, wherein each of said electrically pumped regions includes an electrode layer surmounting said upper cladding layer.

25. (original) The laser of claim 18, wherein said first and second grooves have a width of about 10.0 micrometers.

26. The laser of claim 18, wherein said first groove depth extends at least to said lower cladding layer and said second groove depth extends at least to said quantum-well layer.

27. (currently amended) A multilayer semiconductor laser, comprising:
a substrate;
a multilayer semiconductor heterostructure formed on the substrate;
said heterostructure being divided into an elongated first region and a plurality of electrically pumped second regions;

said first region being optically pumped by radiation having a first wavelength generated and deposited laterally into said optically pumped region by said electrically pumped regions; [[and]]
wherein said optically pumped first region is in a laser resonator and generates radiation having a second wavelength longer than said first wavelength in response to said optical pumping, said second wavelength radiation being delivered as output radiation from one end of said optically pumped region; and wherein each of said electrically pumped second regions has, at an end thereof furthest from said optically pumped first region, a multilayer mirror having a high reflectivity at said first wavelength and a low reflectivity at said second wavelength.

28. (original) The laser of claim 27, wherein said heterostructure includes a quantum-well layer sandwiched between upper and lower waveguide layers, said quantum-well layer and waveguide layers being sandwiched between upper and lower cladding layers.

29. (original) The laser of claim 28, wherein said quantum well layer has a gain bandwidth characteristic of the material from which it is formed and said first and second wavelengths are within said gain bandwidth.

30. (original) The laser of claim 29, wherein said quantum-well layer material is InGaAs, said first wavelength is about 965 nanometers and said second wavelength is about 980 nanometers.

Reasons for Allowance

6. Claims 1, 3-30 are allowed

The following is an examiner's statement of reason for allowance:

None of the references of record teaches or suggests the claimed a multilayer semiconductor laser, comprising, along with all the other claimed feature, said heterostructure being divided into a plurality of electrically pumped regions and **an elongated optically pumped region**, wherein each of electrically pumped regions has, at an end thereof furthest from said optically pumped region, **a multilayer mirror having a high reflectivity at said first wavelength and a low reflectivity at said second wavelength**.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance".

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung VY whose telephone number is (571) 272-1954. The examiner can normally be reached on Monday-Friday 8:30 am - 5:30pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DON WONG can be reached on (571) 272-1834. The fax numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 308-7722 for After Final communications.

Information regarding the status of an application may be obtained from the patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either private Pair or Public Pair. Status information for unpublished applications is available through Private Pair only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have question on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hung T. Vy
Art Unit 2821
April 28, 2005.

Don Wong
Supervisory Patent Examiner
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